Communicable Disease Surveillance

Pam Pontones, MA
State Epidemiologist
Indiana State Department of Health

Why Investigate Diseases?

Prevention is the source of urgency

- Find and fix ongoing point source (contaminated water supply or food)
- Close problematic locations
- Identify agent (“smoking gun”)
- Find, isolate, and treat infectious people
- Provide prophylaxis to those exposed

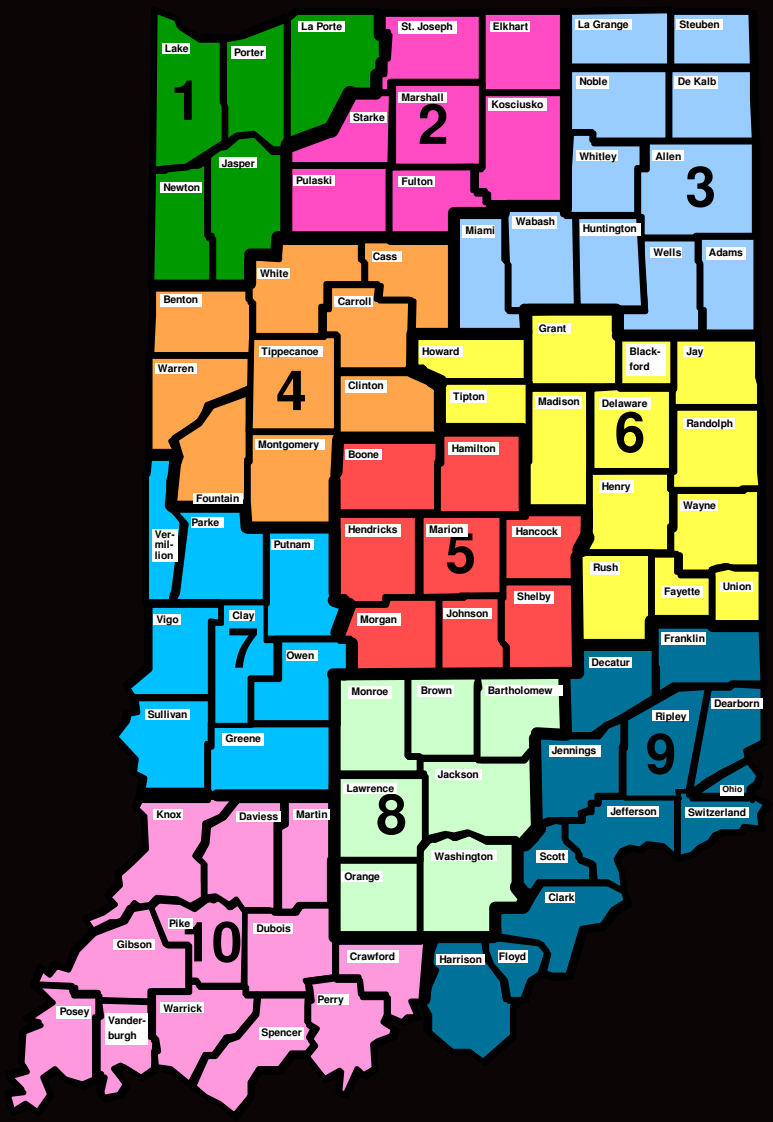
Surveillance and Investigation Division

- Investigate disease outbreaks
- Conduct disease surveillance
- Analyze public health data
- Assist agency program areas
- Serve as subject matter experts
- Serve as media spokespeople
- Advise health care providers and public

Field Epidemiology Program

- Ten public health preparedness districts
- Ten field epidemiologists
  - Assist local health departments with outbreak investigation, case surveillance, infection control
  - Serve as liaison for ISDH in districts
  - Information-gathering projects
  - May serve as media spokespeople

Public Health Preparedness Districts



Surveillance

- Systematic and ongoing assessment of the health of a community
  - Collection
  - Analysis
  - Interpretation
  - Dissemination
  - Use of data
- Provides baseline level data for comparison
- Surveillance provides information for action

Reportable Diseases

- Health care providers, hospitals and labs report to LHD according to law
- LHD use ISDH case investigation forms to investigate and report cases
- Advantages
  - Inexpensive
  - Less labor intensive
  - Routine surveillance method

Communicable Disease Reporting Rule For Physicians, Hospitals, and Laboratories

410 IAC 1-2.3

Purpose of Rule

- Identify and monitor diseases posing a particular public health threat to community
  - severity
  - ease of transmission
  - control challenges
- Define who has authority and responsibility to monitor and respond

Rule Provisions

- Definitions
- Reporting requirements
- Reportable diseases
  - List for physicians and hospital administrators
  - List for laboratories
- Investigation procedures
- General control methods
- Revised rule effective December 12, 2008

Investigation Procedures

- Provider reports case to local health department
- Local health department (LHD) uses ISDH case investigation form to investigate case
  - obtain demographic and clinical information from provider
  - obtain demographic and exposure history from case
- LHD reviews information for risk factors, links
- LHD can advise regarding disease information and control methods
- LHD sends completed form to ISDH via I-NEDSS (preferably) or paper

General Control Methods

- Major components of investigation, including responsibilities
- Isolation requirements, if any
- Quarantine requirements, if any
- Concurrent disinfection requirements
- Protections for contacts
- Treatment

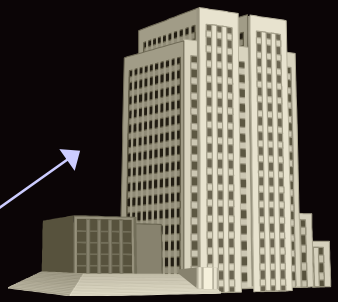
Status of Rule

- Effective December 12, 2008
- Available on ISDH website at http://www.in.gov/isdh/files/comm_dis_rule(1).pdf
- See handout for changes enacted in rule

Disease Reporting Pathway

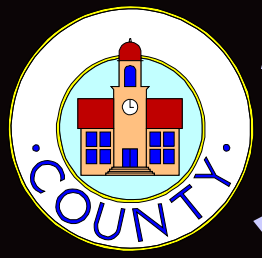
Patient

Health Care Provider or Lab



CDC

Local Health Department



Report Form

State Health Department

Exercise:
Case Investigation

Points to Remember

- Make sure demographic information is current, especially county of residence and age
- Know who should investigate what
  - ISDH: VPDs
  - LHDs: other disease unless specified in rule
- Know sources of information
  - Provider (call first!)
  - Patient

Points To Remember

- Complete and report investigations on immediately notifiable diseases as soon as possible to ISDH
- Vaccine history is very important for VPDs
- Contact your field epidemiologist for assistance or questions

Outbreak Investigation

What is an Outbreak?

- Occurrence of more cases of a disease than expected in a population during a certain time
- One case of smallpox, anthrax, plague, botulism, or measles anywhere in the US is an outbreak requiring immediate response
- Epidemic and outbreak are the same
  - Epidemic is often applied to an outbreak of special concern

Outbreak Detection

- Recognized and reported by health care providers
- Recognized and reported by those affected (e.g., coworkers, school, banquet)
- Detected by public health agency through surveillance
- Enhanced surveillance in cooperation with state and federal public health officials

Purpose of Investigation

- Identify problem
- Determine cause
- Locate source
- Implement control measures
- Prevent further illness

Identify Team

- Epidemiologist
- Laboratorians
- Environmental health specialists
- Public information officers
- Local health department
- Other state agencies
- Federal agencies

Investigating Outbreaks

- Verify outbreak exists
- Identify / count cases
- Organize data → time / place / person
- Identify disease agent
- Identify vehicle of transmission
- Formulate / test hypotheses
- Implement / evaluate control measures
- Report findings

Verifying an Outbreak

- Cases of illness exceed expected number for given population at given time
- May occur suddenly or over period of time
- Identify through direct communication or surveillance data
- Collaboration with local health department determines if outbreak actually exists
- Investigation begins if outbreak verified

Step 1:
Prepare for Field Work

Preliminary Information

- Basic clinical data
  - signs and symptoms
  - onset dates
  - common exposures
- Foodborne outbreaks
  - obtain menu
  - secure leftovers
  - three-day food history

Step 2: Identify and Count Cases and Exposed

Formulate Case Definition

- Initial case definition includes
  - time, place and person descriptions
  - hallmark clinical signs
  - mode of transmission (if known)
- Can change as investigation progresses
- Keep focus relatively open

Identify Population At Risk

- Survey hospitals, ERs, physicians
- Review existing surveillance data
- Question known cases to identify others
- Guest lists
- Enrollment records
- Cases: meet case definition
- Controls: exposed but not ill

Questionnaires

- Used to collect complete, uniform histories
- Includes initial case definition, clinical information, exposure history and related venues
- Specificity depends on information known
- Varies from outbreak to outbreak

Questionnaires

- Administer as soon as possible
- Disseminate or interview personally
- Interview both cases and controls
- Recall bias
- May include more specific questionnaires later for different groups

Cohort Studies

- Known number of persons exposed
- Can contact all in timely manner
- Demographics, attack rates, risk ratios

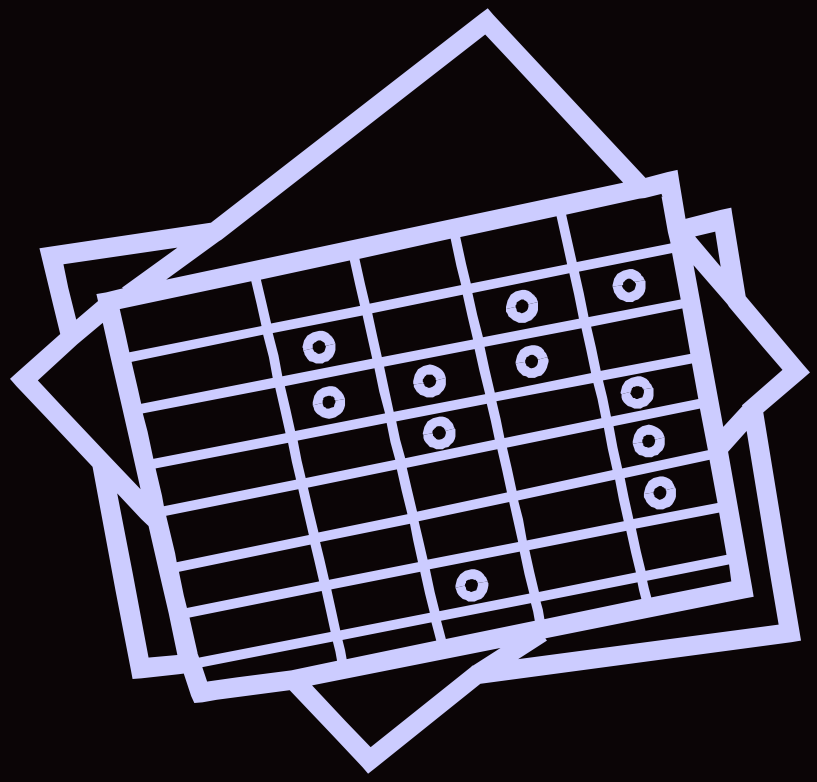
Case-Control Studies

- Large events or exposed population unknown so must sample population
- Quick to assemble
- Controls
  - selected from exposed or baseline cohort
  - matched or unmatched
- Odds ratios

Step 3:
Organize Data

Line Listings

- Spreadsheet format
- One row = one case
- Columns = variables
  - demographic
  - clinical information
  - lab results
  - exposures



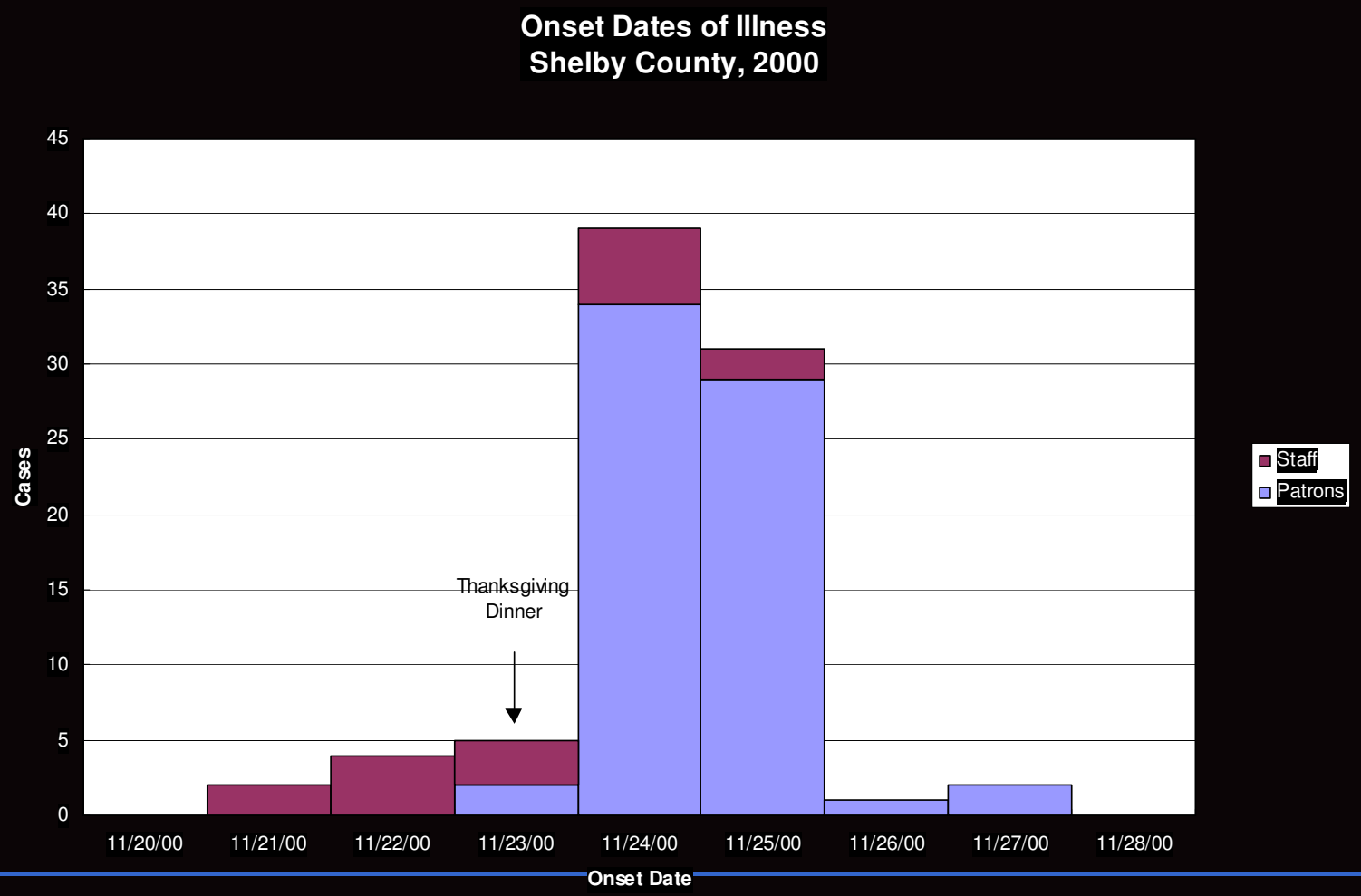
Epidemic Curves

- Plot number of cases by onset date
- Index case: first case of outbreak, can be source of outbreak
- Estimate median incubation time from time of exposure to peak of curve
- Indicate whether outbreak has ended

Point Source Outbreaks

- All exposed at one time
- Cases occur suddenly after minimum incubation time
- Continue to occur throughout incubation period range
- Outbreak stops unless secondary spread
- Curves have steep upslope, more gradual downslope

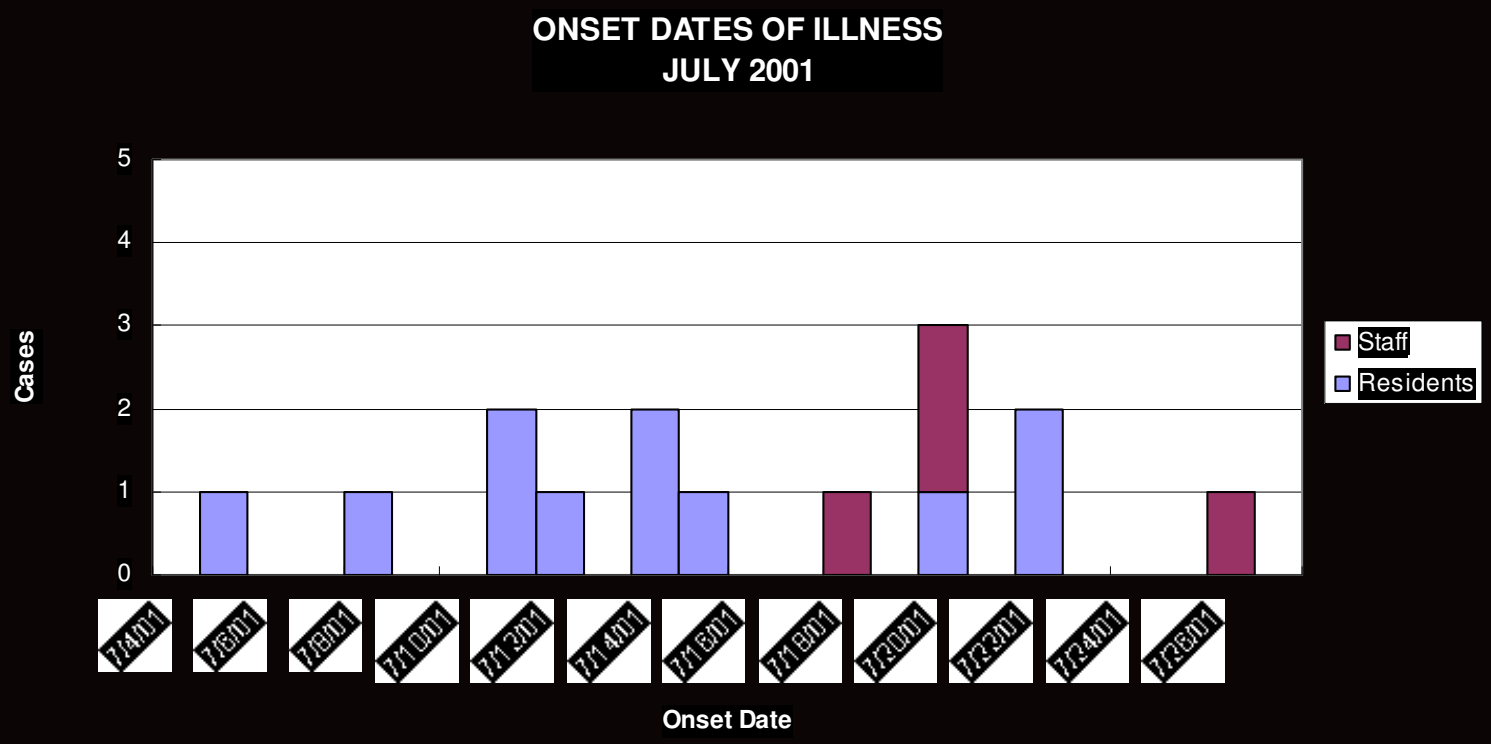
Point Source Curve



Common Source Outbreak

- May begin suddenly or gradually
- Cases do not disappear because of secondary exposure
- Cases trail off very gradually until population immune or control measures effective
- Common source curves have gradual or steep upslope, trickling downslope

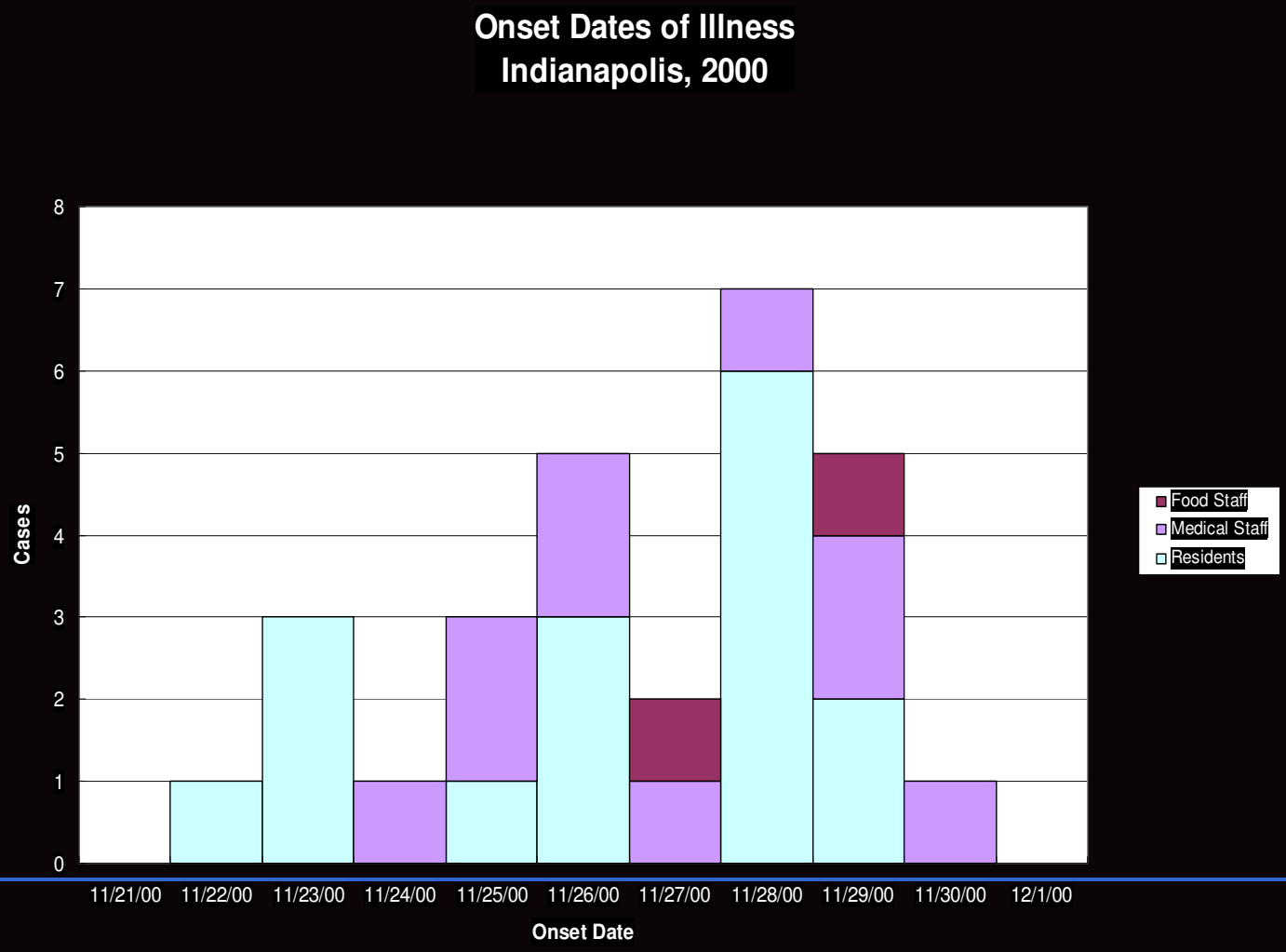
Common Source Curve



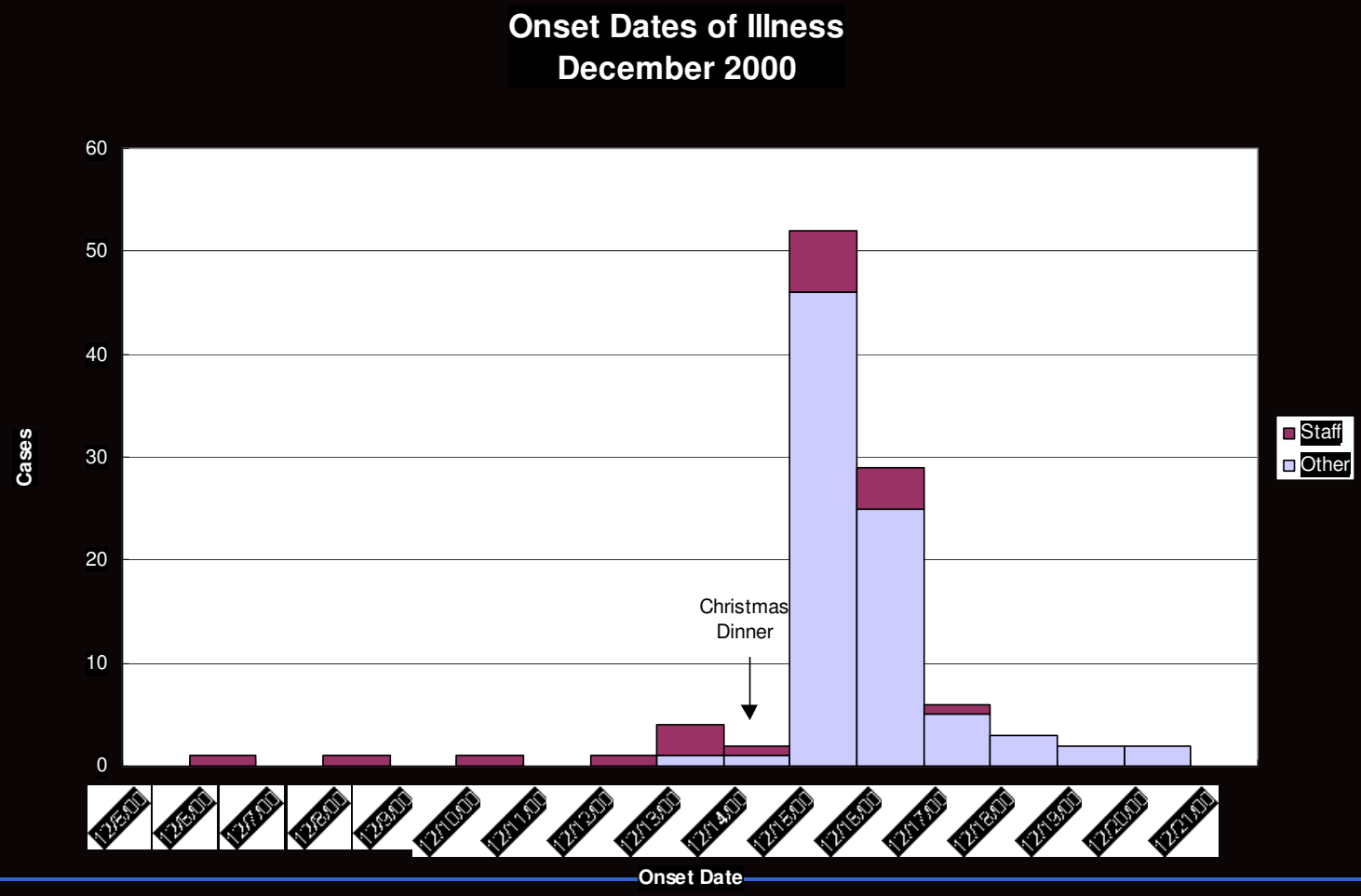
Propagated Outbreak

- Typical of community wide outbreaks
- Increase in cases after first exposure then cases decline until all first exposed immune
- Secondary cases appears one incubation period after peak of first wave
- Propagated curves have successive “waves” of cases separated by incubation period

Propagated Outbreak Curve



Combination Curve



Step 4:
Identify Disease Agent

Collect Clinical Specimens

- Identifies agent and confirms cases
- Obtain results if already collected
- Collect specimens if necessary
- Type of specimen depends on suspected agent, nature of outbreak

Collect Clinical Specimens

- Specimens **must** be labeled with patient's name and collection date
- Submission form must be completed and enclosed with specimen
- Indicate on form that specimen is related to outbreak investigation
- Local health department should collect and transport specimens to ISDH lab

Step 5:
Identify Vehicle of Transmission

Environmental Investigation

- Begins when suspected mode of transmission identified
- Identifies vehicle of transmission
- Samples: food, water, air
- Foodborne
  - conduct HACCP inspection
  - inquire about food handler illness

Step 6: Analyze Data and Formulate Hypotheses

Analyze Questionnaires

- Confirm or refute hypothesis
- Data entered and analyzed
- Compare data from cases and controls
- Form basis for conclusions
- May need to modify initial case definition or hypothesis

Descriptive Statistics

- Calculations used to statistically describe illness rate and time, link exposure to illness
  - Attack rates
  - Risk ratios
  - Odds ratios
- Usually use statistical programs
- Contact your field epidemiologist

Review the Data

- Epidemiologic information/analysis
- Clinical specimen results
- Environmental findings/results

- Hypothesis has to fit data

Step 7: Implement Control Measures

Possible Options

- Post-exposure prophylaxis/treatment
- Recalling/destroying food
- Providing educational information
- Closing an establishment
- Exclusion from work, daycare or school
- Making public announcements

Return from Exclusion

- LHD verifies asymptomatic and counsels employee/student about transmission
- LHD contact employer to emphasize hygiene compliance
- Negative cultures obtained (if required) after completion of appropriate therapy
- May restrict work until results obtained
- Check the communicable disease reporting rule for specific requirements

Step 8: Communicate Findings

Investigation Report

- Outlines investigation, inspections, laboratory results
- Purpose
  - prevent similar outbreaks
  - identify trends/causal factors
  - justify resources used
  - serves as public record

Investigation Report

- Background
- Epidemiologic investigation
- Environmental assessment
- Laboratory results
- Conclusions

Exercise: Outbreak Investigation

Any Questions?

Pam Pontones, MA

State Epidemiologist

317.233.7861

ppontones@isdh.in.gov